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**SCIENCE THROUGH FOLK FORMS - SERIES**

# **LET'S SING & PLAY**



**National Council for  
Science & Technology Communication  
Dept. of Science & Technology  
Govt. of India, Technology Bhawan  
New Mehrauli Road, New Delhi-110 016**

# LET'S SING & PLAY

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# FOREWORD

Formal science education in India has not taken cognizance of, nor attempted to draw from, our rich cultural heritage and art forms. This is surprising, and really a pity, since their use in communication can make it (communication and science education), so very effective. In the informal sector, however, efforts in this direction have been made for some years now, and with a considerable degree of success, too, especially among our rural folks, in different part of the country. But this technique and methodology have been found to work just as well in urban area too.

To help spread use of this form of communication, in promoting science education and popularising science & technology, NCSTC is bringing out a series of compilations of scripts (of songs, plays, skits) which have been developed/deployed during numerous NCSTC projects and programmes all over the country. Obviously, every time any one of these would be used/performed; there are bound to be improvisations, adaptations, improvements, modifications, innovations and the like depending on the time, place and occasion involved. This would be as it should be.

One also hopes and expects that those who have not hitherto used such things in science popularisation/education, would use their genius and first understand the basic philosophy involved in using folk forms to communicate science or scientific ideas/messages/thinking; then grasp and internalise the fundamentals of it well enough to produce their own scripts, in the very near future, which would be most suited to their own environment, situation and milieu.

We also hope that some of these techniques would some day also find their way into our formal system of teaching/learning science.



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## A GLIMPSE OF THE ATOM

Atom ! Atom !  
Oh ! your ego  
Are you the base of  
All things moving and static?  
At first we thought you  
Are indivisible.

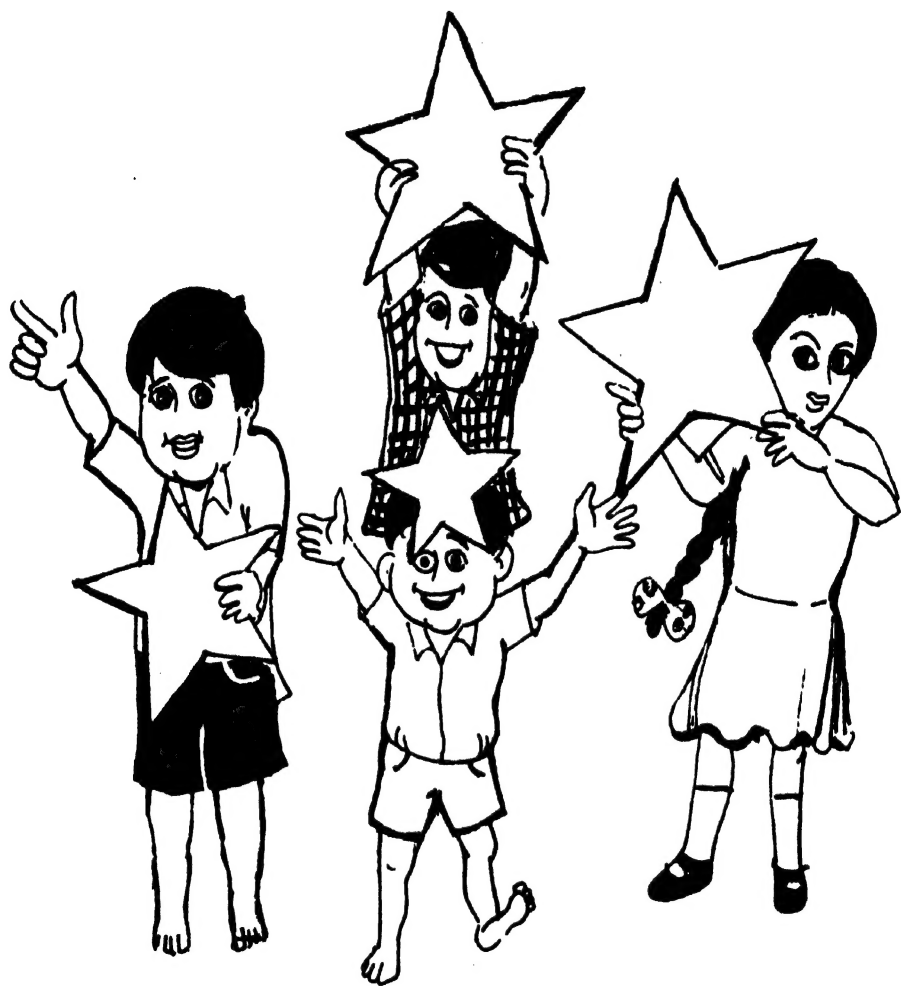
Then came Thomson and Ruthorford  
They stole all your secrets away.  
They said you are  
Electrons; protons and neutrons.

However minute you may be  
How active you are !  
Mad rush of electrons  
The quantum jump.

Movement in your centre  
Defection of protons  
Deception of neutrons.  
The exchange of mesons  
A veritable market place !

Moment we blow you up  
You emanate enorinous energy  
For creation, protection and destruction !  
Using thy mighty power  
Man makes Hiroshimas  
Man makes empires...







## **TWINKLING STARS & $E = MC^2$**

Twinkle, twinkle little star  
How I wonder what you are?  
Up above the earth so high,  
Like a diamond in the sky.

Twinkle, twinkle little star  
How I wonder what you are?  
I will tell you my secret,  
Lend me your ears, oh dear child !

My belly is of plasma form  
Full of protons proud,  
Inconceivably pressurised  
Highly heated in that form.

Four by four do they combine  
Forming alpha particles,  
In between some matter disappeared  
Where is it? Where is it? Can you say?

I can, I can, I will say,  
Once a scientist named Einstein  
Gave this answer long ago,  
 $E=MC^2$   
That is the secret of my twinkle.

Up above the earth so high  
Like a diamond in the sky,  
Twinkle, twinkle little star  
Now I know your secret well.





## **CURIOSITY OF NEWTON**

Once a mad boy who went to the school  
Leaving his notebooks home.  
Sat in the Classroom this mad boy  
A chatter box as he was known.

Then came the teacher of mathematics,  
Gave a problem for every one to solve.  
Problem was solved by every one except the mad boy,  
Then came evening, the school bell rang.

Home ran every one, the mad boy left alone  
Did not take road to home.  
Came to the bank of a river  
Under the apple tree he sat.

Rested there for a while  
Felt sad and miserable,  
His face pale and without a smile.  
"Every one else had a perfect answer  
And not a single doubt in mind.

How, when, where and why,  
Are questions always in my mind".  
And then to the ground from the tree  
Fell one apple, as he saw.

Why? he thought, it fell to the ground.  
No one knew till then  
Secret of that attraction.  
No one knew till then.



Earth mother did well to keep secret  
The force of gravitation.  
Secret (was) revealed by a mad boy  
Whose name was Issac Newton.

The mad boy had a habit  
Everything he would question,  
Along with every perfect answer  
Came thousand questions.



## THE EARTH

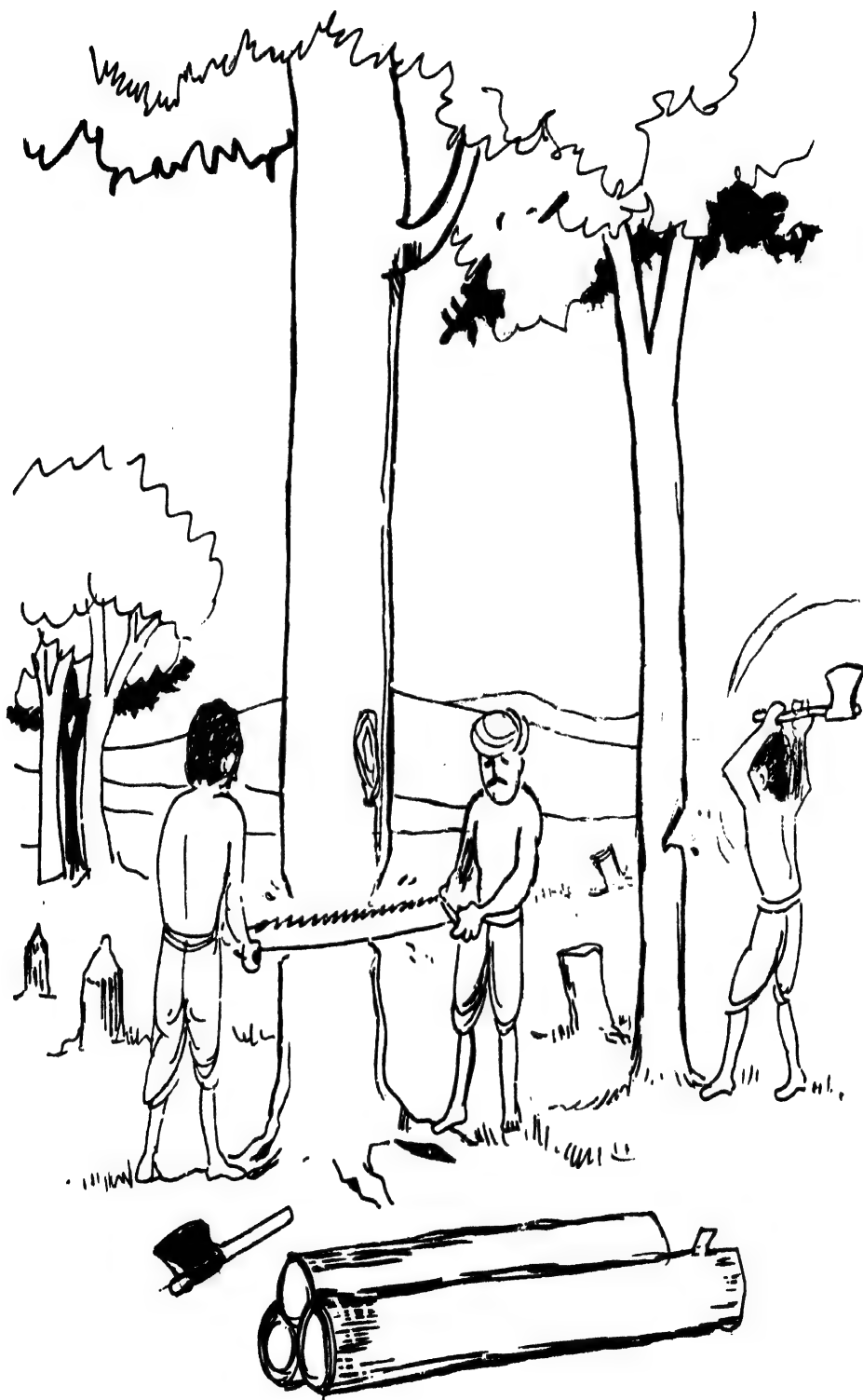
For ages in our mind  
Lives this earth, so fine  
Which we did borrow from the future  
Which we have to give back, for sure  
This is not an inheritance infinite  
For a prodigal son to squander unlimited.

Here on this soil, on the banks of rivers  
With mountains high and plains broad  
From time immemorial stood the trees  
With sprouts and flowers, spreading shades so cool  
Giving out warm beauty of hearts  
Singing softly - men slept in her laps.

Generations grew up under her care.  
When thunder and lightning  
Rent their hearts with fear  
She became their protector  
Giving motherly care.  
Her rivers overflowing with affection.

Gave water sweet to quench their thirst  
When their stomach burnt with hunger  
She gave grains in fields, fruits on trees.  
The sun oozing blood, the rising moon  
Makes their evening beautiful  
The moon shining itself out  
Gives their night a milky light.





Where are those trees  
And their tender milk  
Under the teeth of roaring saws  
Their leaves fallen  
Filling pockets far away

Where are those rivers?  
Flowing from the bosom of earth  
Water made dirty with worms and poison  
New wealth, new millionaires.  
Beware ! You listen  
Listen, you listen.

This earth which makes us what we are  
This earth, these devils make a desert land  
This earth is not a family property  
Inherited from generations bygone  
We borrowed from children  
And we have got to give it back.







## **WHY? WHY? WHY?**

Why? Why? Why?  
The rainbow in the sky  
And stars twinkling above  
The lily is white  
And the rose is red?  
Why? Why? Why?  
Tiny little firefly  
Carry a torch beneath its belly  
And my cat does not fly  
Like crows and pigeons in the sky?  
And why doesn't mango laugh and flutter  
Like sparrows and squirrels on the tree?

Why? Why? Why?  
The Timber thieves are cutting clean  
All trees on the mountain green  
Do Ramoo and his ma  
Go begging on streets?

Why? Why? Why?  
Do people kill each other  
In the name of caste and religion?  
Why starvation, poverty  
And ignorance?  
Why? Why? Why?

It is time to raise the question Why?  
Where ever there is injustice  
There, everywhere  
With an upright head  
Without fear and fright  
Let you thunder,  
Why? Why? Why?





# MULLAH'S HORSE

## A Puppet Drama for School Children

<b>Characters</b>	:	Girl	1
		Boys	4
		Elderly persons	3
		Puppet horses	8

### SCENE 1

(A little girl comes dancing and singing to the arena.)

**Little Girl** : Ding Dong Ding Dong  
Ding Ding Ding  
Dong Dong Dong  
Ding Dong Ding Dong.

**(Laughs Ha! Ha! Ha!....loudly.  
Suddenly remembers something.)**

Oh! I forgot. Father promised to tell  
us a story today, didn't he?  
Brother.....brother.

**(Calls out for him loudly. The elder  
brother enters.)**

**Elder Brother** : What is this Ding Dong, my little sister?

**Little Girl** : Brother....remember. Was it not for today  
that father had promised to tell us a story

**(Elder Brother jumps with joy.)**

**Elder Brother** : True, very true. I forgot about it.



- Little Girl** : Ding Ding Ding..  
Dong Dong Dong  
Pappa....Pappa  
(**Father enters**)
- Father** : What is this Dong Dong, my little girl?
- Elder Brother & Little Sister** : Story...you promised to tell us a story..  
and you forgot.
- Father** : Story?
- Elder Brother** : Yes...the story of Mullah, you promised to  
tell us today.
- Father** : Really? Ok, let it be so.
- (Turning to the audience, consisting  
mainly of children, loudly he makes  
them respond - and with them little  
girl and elder brother also).
- Children, my dear children !
- Little Girl & Elder Brother** : Yes...(audience too should be tempted  
to respond)
- Father** : Do you want to hear the story of the  
Mullah's Horse?
- (From among the audience, 'Yes'. A few  
can sit among them and prompt)
- Father** : Okay, Listen....Long long ago....listen.  
This is a true story not fiction.
- Little Girl** : Where did it take place, pappa?
- Father** : In Arabia. A very old man was living  
there.....who was living there since ages,  
a 'Grandpa'.



**(Father suddenly disappears from the stage while the audience imagine Grandpa, the old man appears. He greets the audience.)**

**(In the voice of the father)**

**Back Stage** : Look there, you see the grand father....Grandpa had three children. All boys.

**(All the three children enter the stage and bow to the audience. Grandpa calls them and embraces them)**

**Grandpa** : I have not only these three children. I have yet another seven dear ones.

**(Suddenly seven horses come up on the other side of grandpa, nodding their head and greet him and the audience. Grandpa turns to his sons and tells them.)**

You should take care of these dumb creatures. They are responsible for all our prosperity.

**(Sons bend their head in agreement. Suddenly grandpa collapses...after a few seconds, in a very feeble voice, he utters).**

My head is reeling and there is a terrific pain in the chest.

**Children** : Oh! God....Father, what has happened to you!

**(They support him and help him to lie down)**



**Rahim** : Brother, bring some water. (The younger one fetches some water. Then embraces the father. A mournful background music starts, indicative of impending death).

**Grandpa** : (To the children with sorrow) My children, I am going to die. You should live together loving and helping each other. When I am buried, you open this cover. I have written every thing you should do in it.

(He lifts up a large cover. The eldest son receives it. The mournful intensifies - suddenly the grandpa is dead. The sons start wailing loudly) Oh papa, oh papa, why did you leave us alone? Oh papa! (The horses too join the chorus of mourning)

## **SCENE - 2**

(The funeral procession. The children carry the coffin. Horses follow behind-sorrowful background music.)

## **SCENE - 3**

**Narrator** : And, thus our grandpa died. The children shed tears. The horses too shed tears. They refused to eat...time passed. It heals all the wounds. The children are now grown up.

The children wonder what were the directives of their father.

(All the sons come on to the stage)



**Rahim** : Let us open the cover and see.

**Kassim** : Good. Let us read it.

**(One son runs inside the house and comes back with the cover, opens it and starts reading loudly)**

“My dear ones. All the three of you should go to other countries for business. Don't deviate from the path of truth and justice. In trade do not cheat. You can divide among yourselves the only wealth I had - these darling horses. Of what is left behind half is for the second son and of still what remains half is to my third son and the other half for my childhood friend Mullah”.

**(There is a complete silence on the stage. After a few seconds, the elder one goes back and brings the horses on to the stage and tries to divide them).**

**Rahim** : This is a complicated problem. How are we going to divide them. What is the half of seven?

**Kassim** : True, very true. How to take three and half horses.

**Karim** : And its half? One and three fourths !

**Rahim** : And it half....Allah....this is an impossible task.

**Kassim** : Let us go to the Mullah. He is a scholar and also our father's friend. He will find a way out.



**Karim**

: Certainly. He is a great scholar.

**(All the three go away followed by the horses)**

#### **SCENE - 4**

**(Mullah enters with the horse)**

**Mullah**

: A horse ride in the morning - It is a good exercise and enjoyable too. **(Fondles the horse)** What my son, what are you looking at? Is anybody coming. **(Looks in the direction at which the horse was looking.)** My...some body is coming **(looks more intently)** Aren't they the sons of my good old friend Sulaiman? And his horses?

**(Raises his hands and greets them)**

As-salam-vale-qum

**(They greet back.)**

**Mullah**

: So..how come all of you are here? Anything in particular? **(The eldest one, without uttering a word, extends the cover to him. He takes out the letter and reads loudly.)**

"My dear ones. All the three of you should go to other countries. Do not deviate from the path of truth and justice. In trade do not cheat. You can divide amongst yourselves the only wealth I had, these darling horses. Let my eldest son take half the number of horses. Of what is left behind half is for the second son. And of still what remains one half is for my third son and the other half for my childhood friend Mullah".





**(Mullah stands stunned. Then walks across the stage to and fro, thinking for some time)**

Half of seven is three and half. And quarter? Dear Sulaiman..What was in your mind? Trying your old friend again. **(Thinks again, then laughs loudly)** When there is a problem you ponder about it. Sulaiman, I found the way. **(He gives a kiss to his own horse and then puts him together with the other horses).**

**Mullah** : Rahim, my boy! You know your father was a good as a brother to me. Whatever was his was mine **(The children react with fear of losing the horses)** and whatever is mine is his too. This darling horse of mine is as much his, as is mine. Consider it as his. Then there will be how many horses?

**Rahim** : Then, total is eight,

**Mullah** : What is your share?

**Rahim** : Half of it.

**Mullah** : How much is that?

**Rahim** : Four.

**Mullah** : Take them.

**(Rahim takes away four horses)**

**Mullah** : Kassim, my son? Rahim has taken his share. What is left behind?

**Kassim** : Four.



**Mullah** : What is your share?

**Kassim** : Two.

**Mullah** : Take away that.

**(Kassim takes away two horses)**

**Mullah** : Karim, my child, both your elder brothers have taken their shares. How many horses are left now?

**Karim** : Two

**Mullah** : What is your share?

**Karim** : Half of it, One.

**Mullah** : And the balance?

**Karim** : That is for you, uncle Mullah.

**Mullah** : Then take your share.

**(Karim try to take away Mullah's horse)**

**Mullah** : My boy, take away your fathers horse. Why do you take uncle's horse.

**(Karim takes away the other horse. Mullah takes away the last one, which is his own horse.)**

**Mullah** : Are you satisfied? Did not every one get his share as per your fathers will?

**All** : Yes, we got it uncle.



## SCENE - 5

(Father completes the story with both son and daughter beside him)

- Father** : And thus Mullah solved the problem.
- Son** : That Mullah was really a smart one. Wasn't he, papa?
- Father** : (Turning to the audience). All right. What was the function of the horse of Mullah in this process.
- Son** : To help in the division. That is all.
- Father** : (Again looking at the audience). What this fellow told is correct. Help the process of division-that was the function of Mullah's horse. In fact, many of you must have met such Mullah's horses earlier. Haven't you?
- Son, Daughter** : No!
- Father** : Haven't you?...(laughs). Many of you have plastic soap boxes, combs etc., polyester clothes, we use many medicines...many of these materials are produced by chemical processes, where different type of Mullah's horses do participate.
- Son** : Horses?
- Father** : Not just horses,, but Mullah's horses. In chemistry they are called catalysts. They help the chemical reactions to take place.
- Son** : Oh! now I see..I have to study about catalysts for the last terminal examination.



**Father**

Really? Then explain to these people what these catalysts are?

**Son**

**(Turns round to face the audience. Prepares himself to do a strenuous thing. Then shoots off what he has learned by heart)**

The decomposition of hydrogen peroxide is a slow process. If we add a little manganese dioxide the rate of decomposition can be increased several times.

As for itself it does not change chemically. Such substances are called catalysts. A substance which causes a change in the rate of a chemical reaction, without itself undergoing a chemical change, is called a catalyst.

**(he is out of breath and is panting hard. The father and sister laugh and father pats the boy).**

**Father**

: Son, do you want some water...

**Sister**

: Papa, what was he shouting about...I did not understand a thing.

**Father**

: **(laughs boisterously)** Don't worry, my little one. He has just vomited what he has learnt by heart for the examination. The thing is simple. You see, this is a glass. An empty glass. I am pouring this liquid. It is called hydrogen peroxide. It is used for washing wounds etc. Now you see small bubbles coming up.



They are oxygen bubbles. See, only very few bubbles are coming. Now I am going to add a little of this powder to it. It is called manganese dioxide (puts the powder and suddenly there is a vigorous bubbling). Look how vigorously it is bubbling. The hydrogen peroxide is decomposing quickly and releasing large quantities of oxygen...now you see it is subsiding...now it has already stopped. The entire hydrogen peroxide has been decomposed into ordinary water and oxygen. And look at the bottom of the glass. The entire manganese dioxide which we have added is there without ANY CHANGE. Manganese dioxide is functioning as a catalyst here.

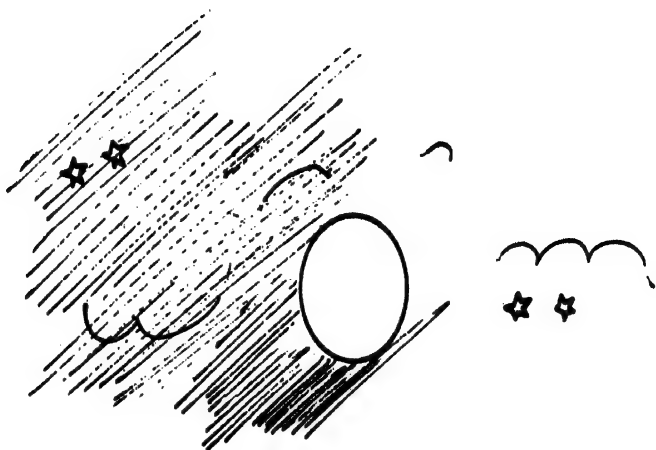
**Son** : Now I understand it really. Yes, even after the division process Mullah's horse remained with Mullah intact and unchanged, as manganese dioxide here.

**Father** : Yes. In chemistry you can find several types of such Mullah's horses. But often the Mullahs, who own the horse, do demand a lot of money. So every nation is trying to identify and develop its own catalytic horses. You too can participate in the nation's effort to identify new and new Mullah's horses. Won't you like it?

**Son, Sister & Audience** : We do, we do.

**(All characters appear on the stage and together they shout.)**  
Science for the people  
Science for the people.





# THE UNIVERSAL ATTRACTION

## A Science Play

**Characters** : Girl 1  
Boy 1  
Mother 1

**(Maya comes running on the stage)**

**Maya** : Is there any one in the house? Is there any one in the house? Mama ! I have become Newton! Newton, the great Scientist!

**Mayur** : Aunty has gone to the Bazar. But why are you shouting so much. How have you become Newton?

**Maya** : I saw a mango falling from our mango tree. When Newton saw an apple falling from an apple tree, he became famous. I have seen a mango falling from a mango tree, can't I be famous?

**Mayur** : You silly girl! Newton found out a theory of Gravity and therefore he become famous. What theory you found out?

**Maya** : No theory, I ate away the mango. But what is this gravity after all.

**Mayur** : Gravity is a force. We are all attracted to the earth because of Gravity.

**Maya** : Oh! Is that why my ball always falls on the earth?



- Mayur** : The ball falls on the earth, the fruit falls on the ground, trees are on the soil, the beans are in pot and boil, air surrounds the globe, houses are sitting on soil, We all walk and do not fall, drums are full, do not spill oil. Gravity is seen everywhere, Gravity is seen everywhere!
- Maya** : Is there no place on earth where gravity does not work?
- Mayur** : No! No! Not a single centimeter of earth is without gravity.
- (Maya's mother calls her from inside)**
- From Inside** : Maya come here! Come home! you had worked late night yesterday for your exam. Have a small nap. Come home!
- Maya** : Mayur, I must go and sleep a while, I will come back in the afternoon.
- Mayur** : Well go, I am also going! **(Mayur goes)**
- Maya** : I will go and get my carpet. This is a nice charpoi, I will have my nap in this lovely shade.
- (Maya goes inside and spreads her carpet on a charpoi and sleeps. She sleeps for sometimes and gets up crying)**
- Maya** : O! Bap re! A terrible thing happened. Mummy! Mummy! **(Mummy has gone to aunty's place)**. Mayur O Mayur! Come soon, come soon.
- Mayur** : **(Comes rushing in)** What's wrong? What's wrong?





**Maya** : Oh! I had a terrible dream. It was an antigravity dream. Bap re! terrible things happened!

**Mayur** : Tell me! Tell me! What happened! What happened!

**Maya** : Do you see these trees. They all flew away.

**Mayur** : Anti/gravity, certainly antigravity!

**Maya** : Water from seas flows away far off. What a dream!

**Mayur** : I wish such an antigravity scene never takes place.

**Maya** : All the houses also flew away and millions and millions human beings flew away far off.

**Mayur** : I wish gravity would never go away from our life. Life will be totally impossible.

**Maya** : Arey Yar! There are still many things which I saw in the dream.

**(Maya's mother comes with a postcard in her hand)**

**Mother** : Maya! Auntie has given this postcard. Would you and Mayur run fast and drop it in the post box.

**Maya** : Mummy this would be impossible if gravity goes away. The card will never fall in the box.



**Mayur** : Aunty, Maya had a great dream - an  
antigravity dream.

**Mother** : Now don't be funny and run fast.  
(Children run with the card singing).

### **POEM**

**Maya & Mayur** : Gravity is must  
For our daily life  
We walk on earth  
Without strain and strife.  
It pulls us in place,  
Like beads in lace.  
It ties the setting sun  
Gravity is a force no fun.



## MAGNITUDE OF FRICTION

**Characters** : Two school boys - Mohan and Vinod

**Mohan** : **(Mohan comes with a book singing the couplet)**

Let me cram! Let me cram,  
Magnet, friction optics and damn,  
Science exam is soon to come,  
Let me cram and keep some mum,  
Let me cram!  
Let me cram.

**(goes on reading and mimicing craming)**

Oh! God,  
I cram this lesson on friction  
Nothing goes in my head,  
I am tired, I am tired,  
Let me keep my head on bed.  
**(Starts crying)**

**(Vinod, his friend, listen's to his crying from a corner and comes in)**

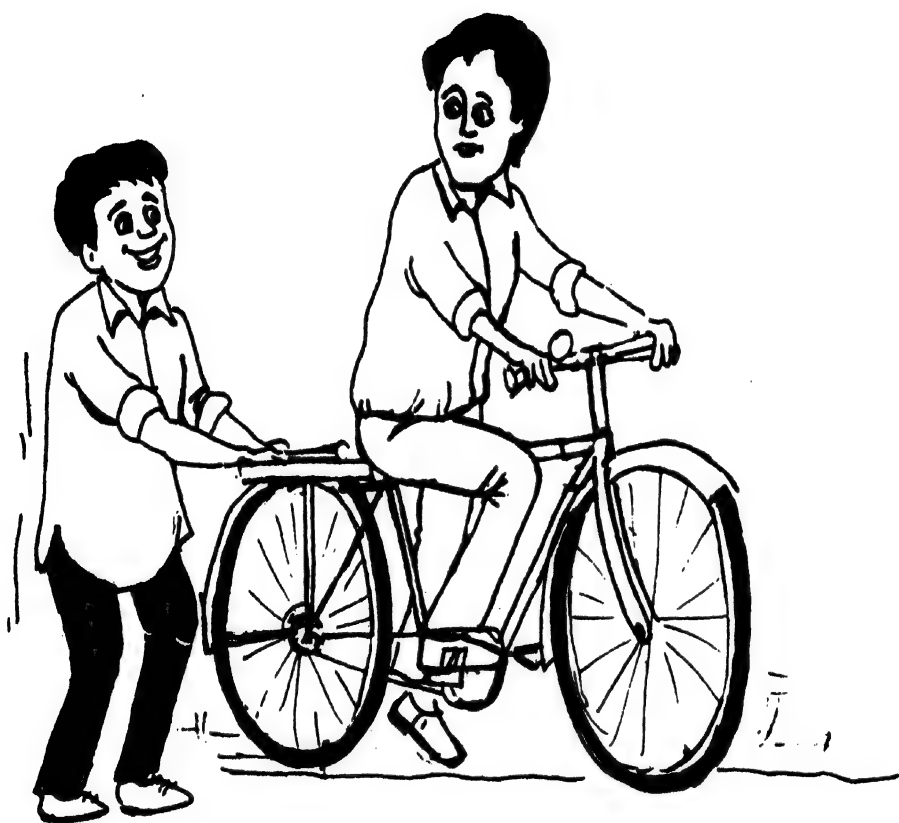
**Vinod** : Mohan! Don't cry! Dear friend,  
What is that which hurts you so much?

**(He puts his arm around Mohan and tries to pacify him)**

**Mohan** : I am cramming this chapter on Friction !  
I can't understand anything.

**Vinod** : You know FRICTION is all around us.  
Why don't we do some activities?  
We will thus play and enjoy,  
But learn as well.





- Mohan** : What activities?
- Vinod** : Activities related to friction.
- Mohan** : You are a funny fellow.  
How can one play and learn at the same time?
- Vinod** : Let me try ! let me try !  
So that you may not cry ! may not cry !  
See here I put two surfaces.  
Find out which surface is smooth  
and which is rough?
- Mohan** : Shall I touch? (**Feels the surfaces**)  
'A' surface is smooth and 'B' is rough !
- Vinod** : Come children come,  
examine the surfaces.  
Feel and tell me  
which surface is smooth  
and which one is rough?  
A or B?
- (**Characters should invite (one or two children) and make them examine the surface**)
- Vinod** : Now take this wooden block  
and put it on the surface marked B  
Strike its straight  
Mark how far it has gone?
- (**Mohan does it. Vinod measures it**)
- Mohan** : Now that shall I do?
- Vinod** : Use the same block and  
put it on A and strike straight  
with same force  
Mark how far it was gone now.
- (**Mohan does it, Vinod measures it**).

- Mohan** : On A it reached 19 centimetres.  
On B it only reached 10 centimetres.  
Mohan, think and tell me  
why on B it travelled on ten?
- Mohan** : **(Scratches his head).**  
Vinod, has it to do something with the  
surfaces?
- Vinod** : Yes ! Yes ! go ahead ! You have done the  
experiment. Now find out the reason?
- Mohan** : Surface A was smooth  
and the block had no obstruction.  
Surface B had a rough surface  
and it caused friction.
- Vinod** : Sabash ! Absolutely right  
boy ! bravo !  
It was a force called friction  
which held the block back.
- (Vinod looks on the side and tries to  
recognise the girl walking in).
- Mohan** : Yes, she is certainly Meena.  
But what has she got in her hand?
- (Meena comes in with a piece of Ceramic  
tile/mirror/in her hand and cries).
- Vinod** : Let us see why little  
Meena is crying.  
Meena stop crying and tell us  
what happened?
- Meena** : My little pencil writes on paper  
but it does not write on  
this smooth and shiny tile or mirror.  
Wouldn't you try?
- (Mohan takes the pencil and tries).**



**Mohan** : Yar ! Its a child's play.  
Let me do it. These small children  
do not know how to write.

**(He tries and tries again but fails. Meena  
laughs ! Vinod laughs).**

**Vinod** : Mohan, give it to me  
I may see why we can't do that.

**(He examines the surface).**

Yar, this surface is so smooth.  
The pencil will not have any  
friction on its surface. Let me  
examine surface at the Back !

**(He examines the surface at the  
back).**

Oh ! this surface is rough !  
It will have greater friction if I write  
with pencil here.

**Meena** : But do not write much,  
Mummy will scold me.

**Mohan** : Meena, this is science and.  
we must try it.  
We will rub it off later.  
Be a bold girl. Vinod you go ahead.

**(Vinod writes Meena's name at the  
back)**

See, it writes because the rougher side  
produces greater friction for the pencil.



**Mohan**

Meena you are in second class only. Now you go to school. Let both of us do a few more activities on friction.

**Vinod**

: Wah bhai wah ! Today is a friction day. Now tell me Mohan, is friction useful for us or harmful?

**Mohan**

: Well it all depends on its use. Now after doing an activity the ideas of friction have become very clear to me.

**Vinod**

: Mohan ! If your ideas have become clearer, show me an example where friction is helpful to us.

**Mohan**

: Wait, I will bring some thing on which we can try our hand.

**(He goes out and brings his cycle, rides and brings it right in front of the audience and uses the brake)**

**Vinod**

: You are really clever ! with your brake you are using FRICTION to stop it. All drivers use FRICTION to slow down or stop their vehicles.

The cycle has a brake,  
The car has a brake,  
The lorry has a brake too,  
What type of brake the boat has?  
What brake the driver uses in a  
steam engine?  
What brake the plane uses?





We found out a good example of use of 'Friction for an advantage'.  
Now can we find out a sample activity where lessening of friction leads to benefit?

**Vinod** : Yes, let me go out for a minute and bring back my wheel. But you keep your cycle here. Don't go out for a ride.

**Mohan** : Why ! I don't understand, why I should keep my cycle.

**Vinod** : Wait Yar ! Wait for a moment.

**(Vinod goes and brings a cycle whose wheel is without ball bearings)**

See my wheel's ball bearings were worn out and I have taken them out. Now move it, give a turn to my wheel with no ball bearing.

**(Mohan turns the wheel).**

Now take out your chain from the back wheel and give a similar push to it for turning.

**(Mohan does that).**

Which one rotates longer and smoother?

**Mohan** : Of course the one with ball bearing.

**Vinod** : Think. What ball bearings have to do with FRICTION here?



- Mohan** : On, I know that the ball bearings has lessened the friction and thus the wheel moved faster.
- Vinod** : Boys ! Science is fun !  
You can play when you learn !
- Mohan** : Children, for today this is enough.  
When you go home find out and try out uses of friction, available around you.
- Vinod** : Observe where friction or creating friction helps.
- Mohan** : Find out where lessening of FRICTION helps.
- Vinod** : Bring back some experiments.  
Experiment with things quite simple.  
Science has lots of fun,  
For children all and one.

**(At this point the group leader will raise questions and organize details of FRICTION along with the total group. Group leader can be children's science teacher, a good science student of college level or parents.)**



## MAGIC FOR CHILDREN

Many activities being performed under the name of magic have relation to some reasonably understandable aspect of science. When curriculum oriented topics are woven *in the fabric of the show* then teaching gets interrelated to magic and becomes activity oriented. This gives opportunity for discussion along with experiment and action, which encourages inventiveness.

Some samples are being provided here. New ideas can be created. The basic requirements are - a good presenter with proper subject knowledge and communication skill.

### MAGIC BIRTHDAY CARDS

Many children consider mathematics as a very dull pursuit. In scientific entertainment a touch of maths will enrich the show and would excite children's mathematical interest.

**Material** : Two black boards or seven chart papers, chalk or black ink and red pen.

**Process** :

- \* Take seven chart papers or space for seven columns can be provided on the black board.
- \* Put the given groups in separate seven boxes so they do not get mixed up.
- \* Keep charts or black board work ready before the show. Keep pointer for pointing to numbers.
- \* Ask a group of children to come on the stage.



# A B C D E F

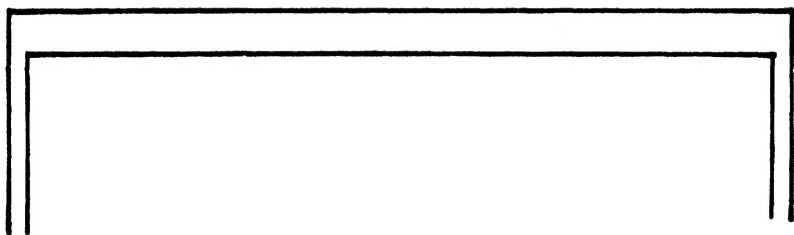
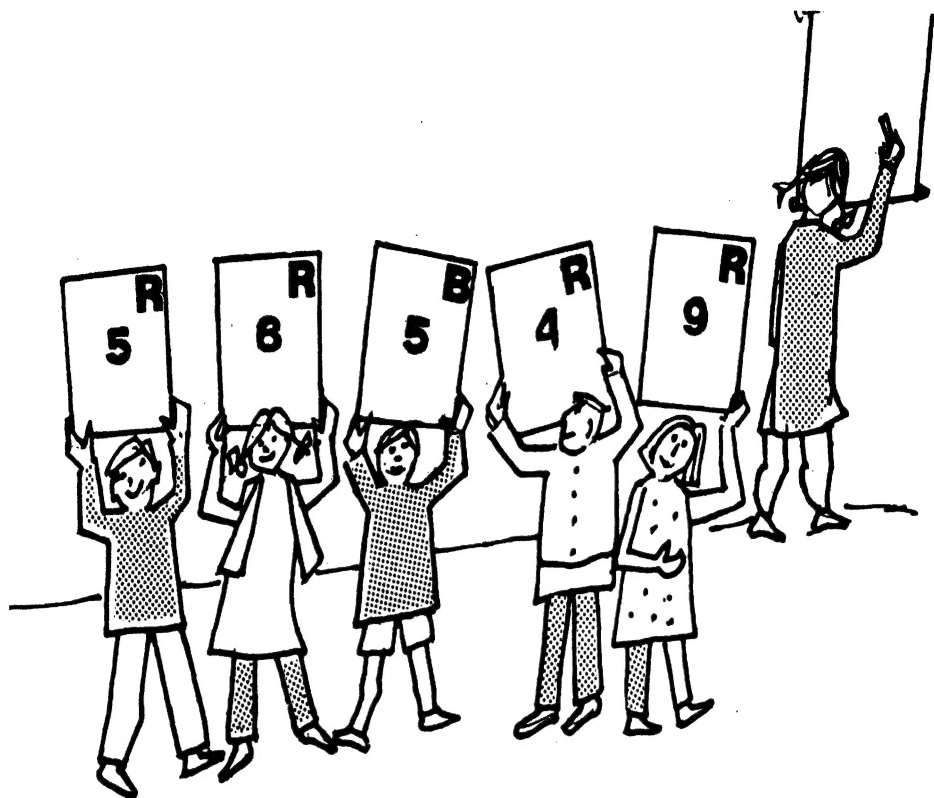
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3	3	5	9	17	33
5	6	6	10	18	34
7	7	7	11	19	35
9	10	12	12	20	36
11	11	13	13	21	37
13	14	14	14	22	38
15	15	15	15	23	39
17	18	20	24	24	40
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21	22	22	26	26	42
23	23	23	27	27	43
25	26	28	28	28	44
27	27	29	29	29	45
29	30	30	30	30	46
31	31	31	31	31	47
33	34	36	40	48	48
35	35	37	41	49	49
37	38	38	42	50	50
39	39	39	43	51	51
41	42	44	44	52	52
43	43	45	45	53	53
45	46	46	46	54	54
47	47	47	47	55	55
49	50	52	56	56	56
51	51	53	57	57	57
53	54	54	58	58	58
55	55	55	59	59	59
57	58	60	60	60	60
59	59				



- \* Let them fix up one number amongst themselves, and write down on a big piece of paper, so at the end of the act, all children can see. This fixed number must be from seven group of numbers, e.g. 61.
- \* Now let one representative point out the cards which has their fixed number.
- \* You should add in your mind left hand top corner numbers from each group.
- \* Here groups A,B,C,D,F, has fixed numbers in them. Now  
 F's left hand corner top has 32  
 C's left hand corner top has 04  
 E's left hand corner top has 16  
 D's left hand corner top has 08  
 A's left hand corner top has 01  
 Fixed No. 61

The presentation plays an important role in such an act.

Mathematical Explanation : Can be presented by maths teacher.



## MAGIC CARDS

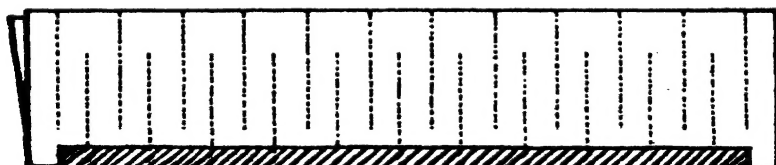
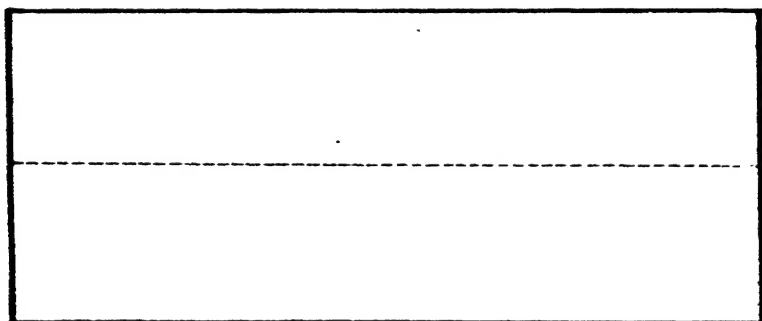
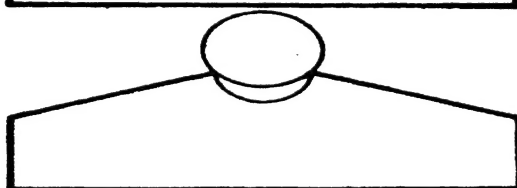
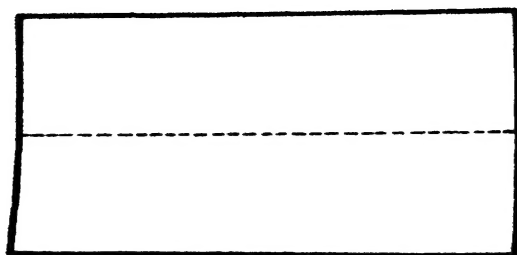
### Process

- \* Make six 20 x 20 cms. card board or covers of old hard cover note books.
- \* First put one figure from 1 to 9 on each card in one colour only (red).
- \* Then turn back of the card and take another colour (blue). Now if the card has on one side 5 then put on other side 7 ( $5+2$ ). Finish all cards like that adding uniform number 2. Therefore ( $8+2$ ), ( $3+2$ ), ( $6+2$ ), ( $4+2$ ) and ( $9+2$ ).
- \* Now the cards are ready.
- \* Now Call 6 children on stage.
- \* The performer should move away from the group and turn his or her back.
- \* Now ask the children to turn these cards in any way they like. But their leader should tell to the performer total no. of Red colour cards.
- \* Once the total number of red card is announced the performer immediately puts on the black board the total of numbers on all the cards without looking at them.

### Simple Addition

The performer knows that the total of numbers on red side is 35. Now out of 6 red 2 has been turned on blue now. Blue means 2 more per card, that is addition of 4, SO THE TOTAL MUST BE 39.







## PASS YOUR BODY THROUGH A USED POST CARD

Geometry plays various roles in our life. By judicious use of geometrical forms the building technologist brings out greater use of materials they use in building materials.

- Material** : Post card, a pair of scissors.
- Process** :
- \* Challenge the audience if anyone knows how to cut a postcard in such a way that they can pass their body through it.
  - \* When some of them come out, tell them to sit on stage with you and give chance to others.
  - \* If one among the audience fails, let the person who have come on stage try.
  - \* If they also fail, then show them this solution:  
Double fold Tight folding and then cutting as shown.
  - \* The cutting should be thin but not too thin.

This will initiate the child activities. This will stimulate the child's inner urge for dividing geometrical shapes for achieving needed solutions.

